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THE FRESHWATER CRABS AND PALAEMONID PRAWNS (CRUSTACEA: DECAPODA) OF BATAM ISLAND, RIAU ARCHIPELAGO, INDONESIA, INCLUDING DESCRIPTIONS OF TWO NEW SPECIES

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Abstract.—The freshwater crab (Brachyura: Parathelphusidae) and prawn (Caridea: Palaemonidae) fauna of the island of Batam in the Riau Archipelago, Indonesia, is documented and discussed. Three species of crabs *Parathelphusa maculata* De Man, 1879, *Parathelphusa batamensis,* new species, and *Irmengardia nemestrinus,* new species, and two species of prawns, *Macrobrachium malayanum* (Roux, 1936) and *Macrobrachium trompii* (De Man, 1898) are recorded. Descriptions and figures are provided for the two new brachyuran taxa.

In a recent survey of the aquatic fauna in the forests of Batam, a large island some 20 km southeast of Singapore, in the Riau Archipelago (Fig. 1), numerous specimens of brachyuran crabs and prawns were obtained. The island of Batam, which covers some 400 km^2, is being rapidly developed, and large tracts of land are currently being or already have been cleared for housing, industrial and commercial projects. The scale of the development plans are such that much of the native freshwater fauna will be (if not already) under serious threat in the years to come. As almost nothing is known about the freshwater decapod fauna of Batam, a brief account of the species present will thus be of interest.

A total of three brachyuran species of the family Parathelphusidae, *Parathelphusa maculata* De Man, 1879, *Parathelphusa batamensis,* new species, and *Irmengardia nemestrinus,* new species, and two caridean prawns of the family Palaemonidae, *Macrobrachium malayanum* (Roux, 1936) and *Macrobrachium trompii* (De Man, 1898) were collected. A brief account of these species, including descriptions and remarks on the two new taxa, is presented in this paper.

Measurements for the crabs are listed as carapace width by carapace length. The terminology used follows that by Ng (1988). The abbreviations cl, rl and bl are for the prawn carapace, rostral and body lengths respectively. The carapace length is measured from the postorbital margin to the posterior margin of the carapace; rostral length from the tip of the rostrum to the postorbital margin; and the body length from the tip of the rostrum to the posterior margin of the telson. Specimens are deposited in the Zoological Reference Collection (ZRC), Department of Zoology, National University of Singapore. The collecting sites are indicated on Fig. 1 and correspond to the site numbers in the materials examined for each species.

Systematic Account

Family Parathelphusidae

Parathelphusa maculata De Man, 1879

Material examined.—3 males (largest 30.0 by 23.5 mm), 2 females (28.1 by 22.3 mm), ZRC, sites 2, 3, 4, southwestern and eastern Batam island, leg. P. K. L. Ng, 21 Jan 1992.

Remarks.—This common lowland species is known from southern Sumatra, Peninsular Malaysia and Singapore (see Ng

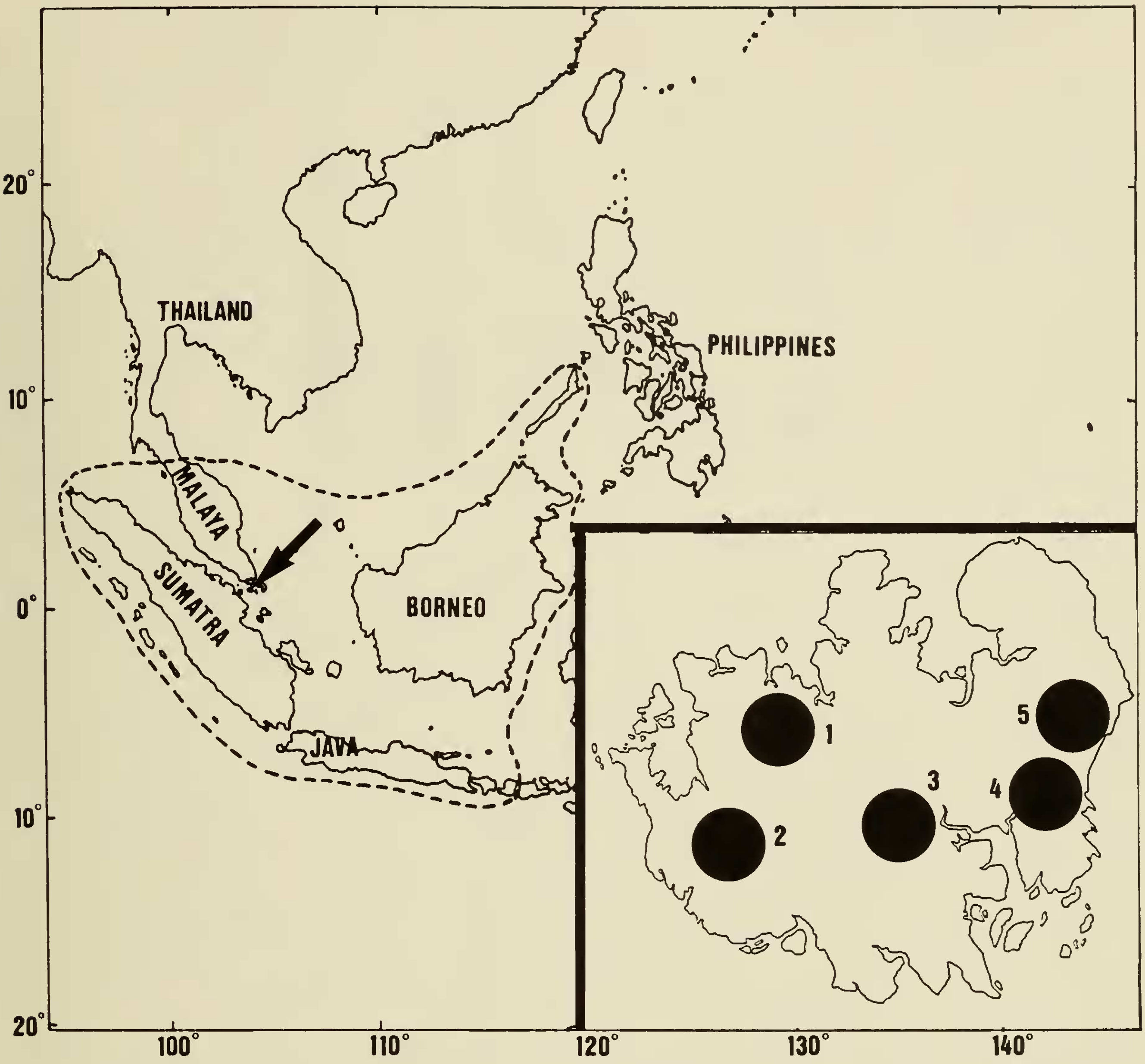

Fig. 1. Map of Southeast Asia, showing the position of Batam island (arrow) in the Riau Archipelago, Indonesia. The dashed lines demarcate the Sunda Shelf. Inset: Map of Batam, Riau Archipelago, showing collecting sites.

1988, 1990b). (See *Remarks* for next species.)

Parathelphusa batamensis, new species
Fig. 2

Material examined.—Holotype male (29.6 by 24.2 mm), ZRC, 7 paratype males, 4 paratype females (largest 28.7 by 23.0 mm), ZRC, site 1, peat swamp forest streams, fringed by *Pandanus*, western Batam island, Riau Archipelago, Indonesia, leg. P. K. L. Ng & K. K. P. Lim, Feb 1991.

Description.—Carapace transverse, gastric and branchial regions slightly swollen, surfaces smooth, evenly convex, with numerous black spots, especially on lower half of body, pterygostomial, sub-branchial and suborbital regions. Frontal margin straight, frontal median triangle well formed; external orbital angle truncate, outer margin convex to sinuous, anterolateral margin with 2 epibranchial teeth, teeth directed forwards, posterolateral regions with strong oblique striae. Epigastric and postorbital cristae

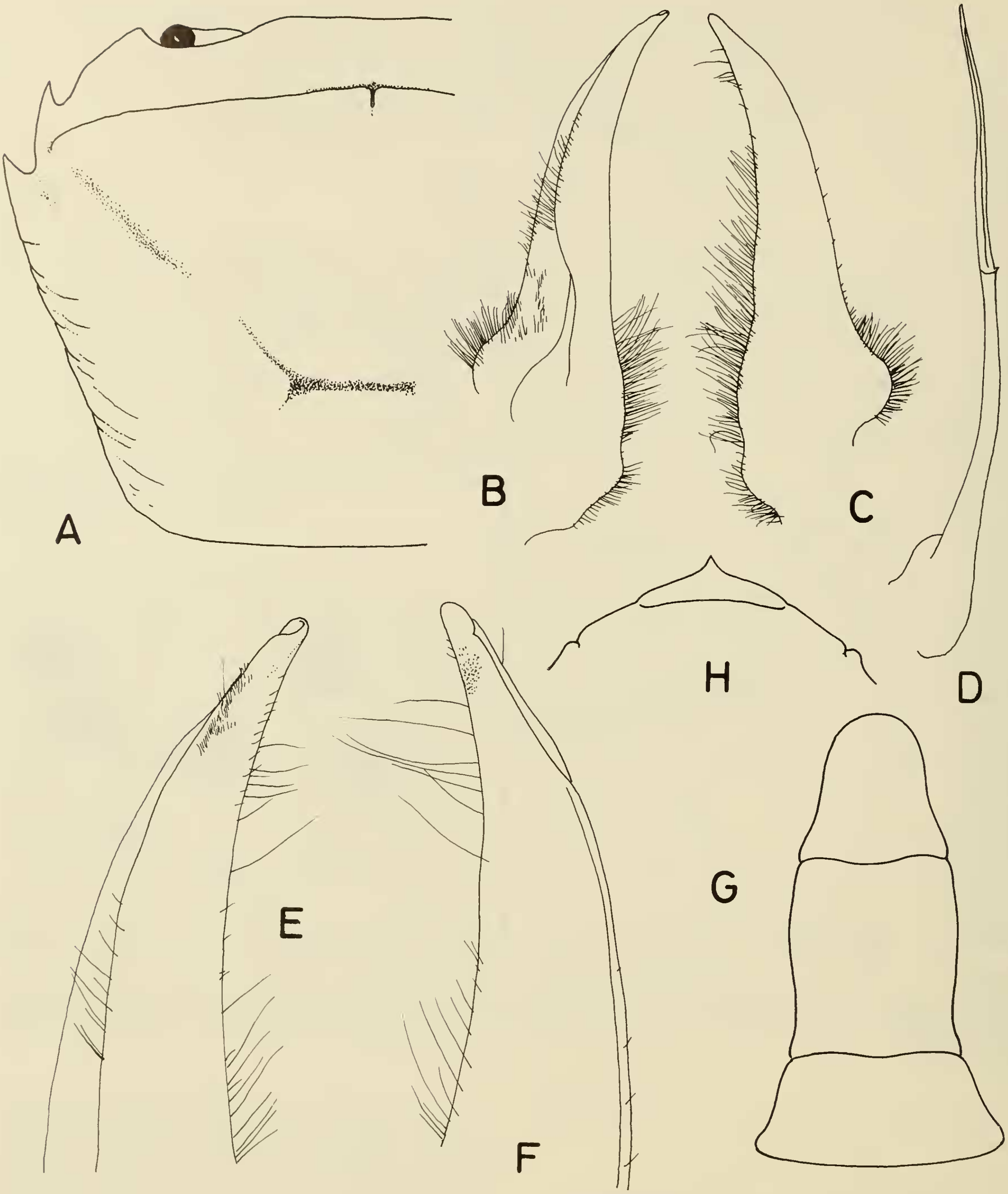

Fig. 2. *Parathelphusa batamensis*, new species. Holotype, 29.6 by 24.2 mm, ZRC, Batam. A, left side of carapace; B, C, E, F, left G1s; D, left G2; G, last three abdominal segments; H, anterior part of sternum. (B, E, ventral views; C, F, dorsal views; E, F, distal part of G1)

sharp, strong, confluent, subparallel to frontal margin, external edges stopping just before base of first epibranchial tooth, epigastric cristae separated by deep cleft. Cervical grooves shallow; H-shaped central depression deep, prominent. Third maxilliped exopod with long flagellum on exopod.

Chelipeds subequal in males; outer surfaces smooth, black spots present on upper half of palm and dactylus; fingers longer than palm in both sexes, not pigmented black, distal part beige-colored. Carpus with well developed sharp spine and basal denticle on inner distal margin; merus with sharp subdistal spine on upper margin.

Second ambulatory leg longest, with distinct sharp subterminal spine on each of the dorsal meral margins of first 3 pairs, merus of last pair with blunt subdistal knob.

Suture between sternal segments 2 and 3 slightly concave towards buccal cavity, with distinct marginal notch between segments 3 and 4. Male abdomen T-shaped, lower margin of segment 4 slightly convex in adults; segment 7 distinctly longer than half length of segment 6.

G1 stout, gently bent outwards, outer margin of proximal part of subterminal segment entire, not clefted at proximal part, tip rounded. G2 with long distal segment, about 0.69 times length of basal segment.

Etymology.—The new species is named after its island of origin, Batam.

Remarks.—*Parathelphusa batamensis,* new species, belongs to the same group of species as *P. maindroni* (Rathbun, 1902) (see Ng 1992). Its carapace is swollen, but not to the degree of *P. maindroni, P. reticulata* Ng, 1990a, or *P. convexa* De Man, 1879. In its carapace physiognomy, *P. batamensis* is closest to *Parathelphusa oxygona* Nobili, 1903 (incorrectly synonymized with *P. incerta* (Lanchester, 1900), by Bott 1970, see also Ng 1990b), but differs in the form of the external orbital angle (outer margin distinctly sinuous but straight in *P. oxygona*) and the outer edge of the postorbital crista reaching the median part of the base of the first epibranchial tooth (reaches between the base of the first epibranchial tooth and external orbital angle in *P. oxygona*). The G1 of *P. batamensis* is very different from that of *P. oxygona* in having the distal part more strongly curved, the tip being directed laterally outwards (straighter, the tip directed upwards in *P. oxygona*). The carapace patterns of live or fresh specimens of both species are quite different. In *P. batamensis,* the carapace is distinctly spotted, the background color being dull orange. In *P. oxygona,* the spots are smaller, more diffuse, forming rosette-like patterns.

Ecology.—All the specimens of *P. batamensis* were obtained from one area on the western part of the island, with the forests there being intermediate between freshwater and peat swamps (sensu Anderson 1964). They were collected from a well shaded, shallow, relatively fast flowing blackwater stream in a disturbed swamp forest. The banks were overgrown with *Pandanus,* and the waters were dark tea-colored. The pH of the water was about 5. The substrate was clay and leaf detritus. The crabs were obtained from burrows along the waterline as well as among the submerged roots and leaf litter. On the southern and eastern parts of the island where typical freshwater swamps are present, only *P. maculata* was present instead. The situation here seems to parallel that in Singapore, where in typical forest habitats, *P. maculata* is found, whereas in the more acidic waters deeper in the swamp forests, it is replaced by *P. reticulata* instead (see Ng 1990a, 1990c). The carapace of the two species are similar, although that of *P. batamensis* is more punctated and the gastric regions slightly more inflated. The G1s of all the males of both species (including young specimens) were examined, and they are consistent for each species as currently defined.

Irmengardia nemestrinus, new species
Fig. 3

Material examined.—Holotype male (16.9 by 14.5 mm), ZRC, 5 paratype males, 1 paratype female, 2 paratype juveniles, ZRC, site 3, northeastern Batam island, leg. P. K. L. Ng et al., 29 Jan 1992.

Description.—Carapace squarish, high, surfaces smooth, dorsal surface with scattered and indistinct black spots. Frontal margin almost straight, with well developed frontal median triangle; external orbital an-

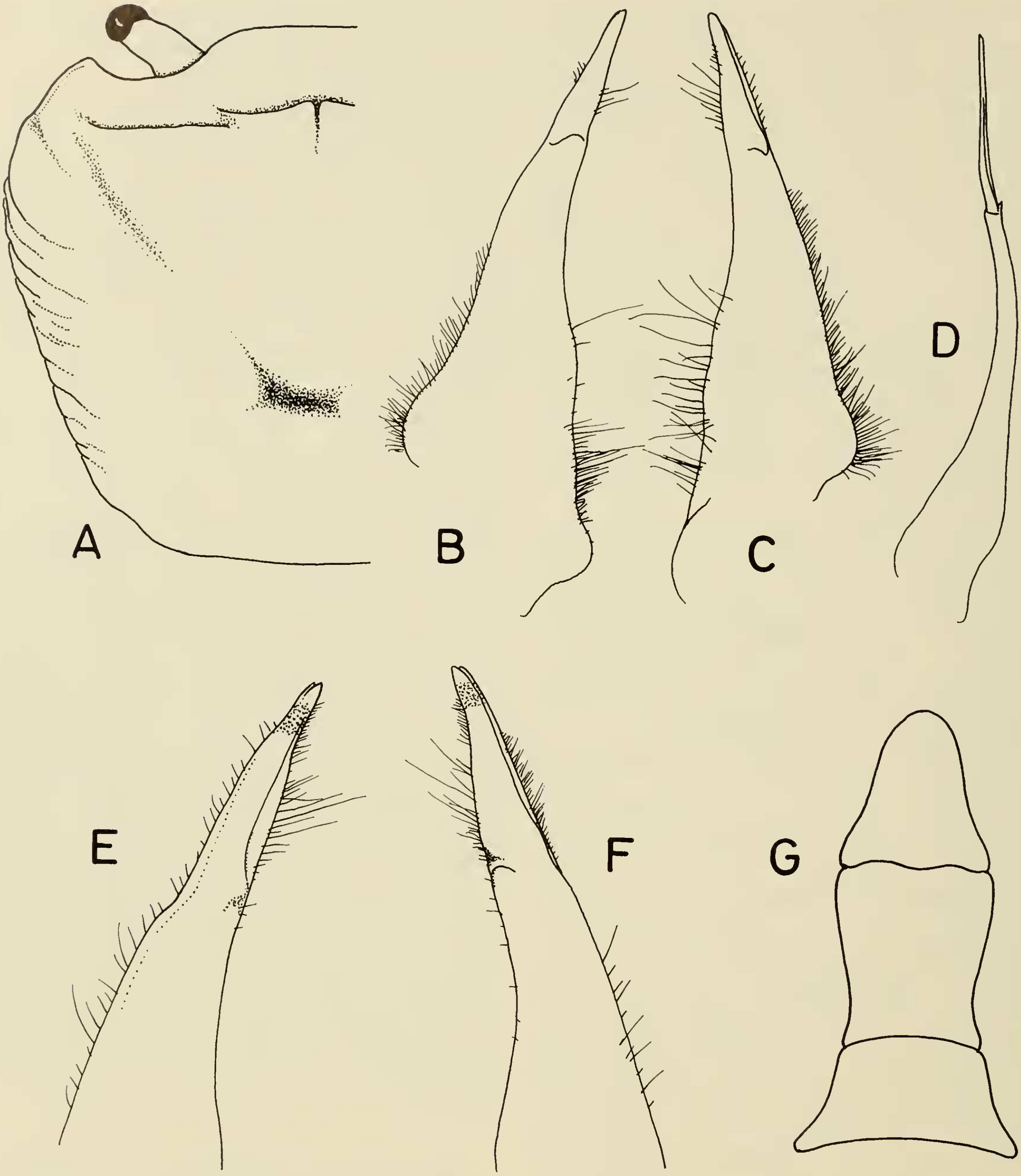

Fig. 3. *Irmengardia nemestrinus,* new species. Holotype, 16.9 by 14.5 mm, ZRC, Batam. A, left side of carapace; B, C, E, F, left G1s; D, left G2; G, last three abdominal segments. (B, E, ventral views; C, F, dorsal views; E, F, distal part of G1)

gle broad, truncate, outer margin convex to gently sinuous, about 3 times length of inner margin, not clearly separated from anterolateral margin; epibranchial tooth very low, indistinct; antero- and posterolateral margins not clearly demarcated, posterolateral margins with distinct oblique striae. Cervical groove shallow; H-shaped median depression deep. Epigastric cristae sharp, sinuous, slightly anterior to postorbital cristae, separated by deep cleft; postorbital cristae not very sharp, distinct, subparallel to frontal margin, separated from epigastric cristae by distinct oblique groove.

Chelipeds distinctly unequal in large males; larger male chela very high, appears laterally flattened, outer surfaces finely granulose; fingers shorter than palm, broad, blade-like, especially pollex; fingers of smaller chela longer than palm, not flattened or blade-like. Carpus with sharp spine on inner distal angle; merus with short sharp subdistal spine on upper margin.

Second ambulatory leg longest, with distinct acute subterminal spine on each dorsal meral margin.

Suture between sternal segments 2 and 3 very faint. Male abdomen distinctly T-shaped, segment 7 longer than segment 6, lateral margins of both segments distinctly concave.

G1 slender, directed outwards, terminal and subterminal segments clearly separated, outer margin of subterminal segment concave, terminal segment sharply tapering, about 0.32 times length of subterminal segment. G2 with distinct distal segment, 0.46 times length of basal segment.

Etymology.—The species is named after "Nemestrinus," the god of groves, alluding to the habitat of the species. The name is to be used as a noun in apposition.

Remarks.—The present new species is closely allied to *I. johnsoni* Ng & Yang, 1985, from Singapore, and the two species cannot be separated on external characters easily (cf. Ng 1988). The main external character is the width of the ambulatory dactylus, which in *I. johnsoni* is proportionately slightly wider. The G1s of the two species are quite different. The terminal and subterminal segments are more slender in *I. nemestrinus* (terminal segment 0.32 times length of subterminal segment; it is 0.45 for *I. johnsoni*), the terminal segment is straighter, and the outer margin of the subterminal segment is less concave (see Fig. 3E, F).

Ecology.—The specimens were all collected from a fast flowing stream with slightly tea-colored waters draining from a freshwater swamp forest. The substrate was mud and sand, and overgrown with the sedge *Eleocharis* sp. The edge of the stream was lined with dead ferns and leaves, and most of the specimens were collected from under this detritus.

Family Palaemonidae

Macrobrachium malayanum (Roux, 1936)

Material examined.—75 males, 16 females, ZRC, sites 2, 3, 4, Batam island, Riau Archipelago, Indonesia, leg. P. K. L. Ng, 29 Jan 1992.

Remarks.—This is the most common palaemonid freshwater prawn on Batam, and is present in every unpolluted freshwater stream which was sampled. The largest male (bl 64.3 mm, cl 18.6 mm, rl 10.4 mm) collected is the largest specimen of this species known thus far. The largest specimen known hitherto is the holotype of *M. geron* Holthuis, 1950 (bl 61 mm), which was synonymized with *M. malayanum* by Chong & Khoo (1987). The specimens of this species at Batam tend to have consistently shorter and more cup-like carpi, and in this respect, resemble *M. pilimanus* (De Man, 1879) and its allies. However, the pubescence on the larger male chela, form of the uropod, and rostrum, correspond best with *M. malayanum.*

Macrobrachium trompii (De Man, 1898)

Material examined.—2 males, ZRC, site 2, southwestern Batam island, Riau Archipelago, Indonesia, leg. P. K. L. Ng, 29 Jan 1992.

Remarks.—Only two specimens of this species were obtained from one area in Batam. This species is normally associated with forest streams and more acid waters (see Johnson 1966, 1968). One of the specimens (bl 76.7 mm, cl 22.5 mm, rl 12.8 mm) is the largest of this species known thus far (see Ng & Chong 1992).

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